

CHECKLIST OF POTENTIAL RESOURCE ISSUES ASSOCIATED WITH TRADITIONAL HYDROPOWER PROJECTS

ISSUE	RESOURCE IMPACT	CONCERN
Impoundments	Shoreline erosion, sediment deposition, and altered aquatic community	<ul style="list-style-type: none"> • Shoreline erosion may be accelerated under various impoundment management scenarios • Reduced water velocity causes the water to drop its sediment load and fill the impoundment. • Impoundment fish assemblages typically resemble lacustrine communities rather than fluvial/riverine communities.
Raise Impoundment Water Level	Inundate free-flowing habitat	<ul style="list-style-type: none"> • Loss of fluvial habitat • Increased sediment deposition could degrade suitability of aquatic habitats in impoundment and below dam • Increased residence time could degrade water quality; e.g., temperature, and change mussel and fish community composition • Loss or change of wetland composition (functions/values) • Impacts to riparian vegetation by increased water table • Loss or gain of colonial bird nesting in trees • May affect function / operation of existing fish passage facilities
Impoundment Water-level Fluctuations	Periodic dewatering of littoral zone and fluctuations of water depth and velocity, especially upper end of impoundment, shore line, and shallow areas.	<ul style="list-style-type: none"> • Invertebrates susceptible to desiccation, predation • Impacts to submerged and emergent aquatic vegetation • Impacts to shoreline plant communities • Increased susceptibility to invasive plants becoming established • Loss of persistent habitat for young-of-year fish and invertebrates • Dewatering of littoral fish nests • Fish nest abandonment • If seasonal drawdowns, timing could cause mortality of hibernating herptiles, and loss or displacement of fur bearers; e.g., beaver, muskrat. • Drawdowns can increase predation of nests and young of loons and other ground nesting birds • Increased water levels can flood nests and young of island/shoreline nesting species like loons • Seasonal and/or deep drawdowns may affect mercury levels • Long residence time (i.e., turnover) under peaking or store/release mode could cause dissolved oxygen (DO) and temps. to deviate from state standards and/or reach critical levels for fish/mussels

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Below-Dam Flows	Flow fluctuations due to hydro operations	<ul style="list-style-type: none"> • Some effects listed for impoundments can occur downstream of the dam as flows fluctuate • Reduction in persistent habitat due to change in amount and location of suitable habitat between base flows and peak flows(habitat location shifts, vulnerability to predation) • Invertebrates susceptible to desiccation & predation due to periodic dewatering of stream margins and shallow water areas • Dewatering of fish nests • Fish nest abandonment due to changing depth, velocities • Increased susceptibility to invasive plants becoming established • If long periods between generating, DO and temps may deviate from state standards and/or reach critical levels for fish/mussels • Velocity barriers to upstream fish movement and migration • Loss / reduction of woody debris and detritus
Bypass Reaches	Flow regime altered from pre-project condition	<ul style="list-style-type: none"> • Reduction or cessation of flow can eliminate habitat, reduce habitat suitability, and/or degrade water quality in bypass reach • Change in substrate composition, especially fines, gravel, cobble
Intake Racks / Screening	Impingement/Entrainment	<ul style="list-style-type: none"> • If approach velocities and spacing of intake racks, punch plates, screens, etc. are not designed properly, fish could become impinged or entrained
Intake Location	Vertical elevation of intake	<ul style="list-style-type: none"> • Deep intake could draw off low DO water, high intake could draw off high temperature water – either could cause water quality issues downstream
Turbine Type	Injury or mortality of entrained fishes	<ul style="list-style-type: none"> • Different turbine types present different risks of injury or mortality (also influenced by head at project, size of turbines, species and life stage of fish, etc.) • Routing flow through turbines versus spill over dam could lower DO (lack of reaeration for most types; crossflow and Archimedes Screw turbines may be exceptions)

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Fish Passage – proposed project @dam with existing fishway	Reduction of passage efficiency, safety, timeliness, and effectiveness	<ul style="list-style-type: none"> • Upstream migrants could be falsely attracted to the tailrace discharge, resulting in delay or reduction in # of fish passing upstream • Far field attraction and/or zone of passage to upstream fish passage facility may be altered by change in hydrology or physical modification • Most downstream migrants would be attracted to intake – risk of injury/mortality due to impingement/entrainment
Fish Passage – Project w/ existing fishway up for relicense	Are existing facilities providing safe, timely and effective passage?	<ul style="list-style-type: none"> • Are there identified passage problems? • Is existing information sufficient to determine if there are any problems? • Will any proposed project changes potentially affect safe, timely, or effective fish passage? • Have target species/life stages changed since fishways were constructed?
Fish Passage – Proposed or existing project with no passage facilities	Need, Timing, Target Species	<ul style="list-style-type: none"> • Determine if there is a biological or management need to accomplish fish passage through the project • Determine appropriate timeline for implementation. • Determine target species, relevant design criteria, etc.
Transmission Lines – New and Existing	Construction, Operation, Maintenance	<ul style="list-style-type: none"> • Land that needs to be cleared for new lines may contain sensitive spp or natural communities • Ongoing maintenance activities of transmission corridor could use methods that have secondary effects to wildlife and/or habitat (e.g., herbicides) • Do certain maintenance activities of power lines provide a benefit to early successional species? • Electrocution of raptors and large birds • Clearing vegetation in rights-of-way during bird nesting season • Bird strikes at over-water transmission lines